

The triennial Hương exam: Deducing laureates' birth years

Updated 24.7.21 • Started 2024.01.21

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NOTE-1: The present document, which is **continuously and frequently updated**, complements the documents below, particularly in pointing out misprints/errors in Vietnam-history books:

Internet Archive: [Nguyen Ngoc Bich \(1911-1966\): A Biography](#), Internet Archive

Internet Archive: [Marco Polo's Caugigu - Pham Ngũ Lão's Đại Việt - 1285](#), Internet Archive

Internet Archive: [Notes on Vietnam history](#), Internet Archive

Internet Archive: [The triennial Hương exam: Deducing laureates' birth years](#), Internet Archive

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NOTE-2: This document is work in progress and having many planned updates with the update and starting dates shown above.

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Introduction

This document is part of our family history, especially for those descendants who are born and educated outside of Vietnam, and who would not know Vietnamese literary history, in particular the prestigious triennial exams to become mandarins (government officials).

“In Confucian cultures the most respected road to upwards social mobility goes through education, not through acquisition of wealth. Confucian society resembled the aristocratic ideal expressed by [Alexis de Tocqueville](#): if everyone thought that one day he could become member of the elite, the privileges of the elite would be attractive even to those who did not profit from them: ‘*De cette manière les vices mêmes de l’institution feront sa force*’ [This way even the vices of the institution become its strength.] ” [Tønnesson, Stein](#) (1991), [The Vietnamese Revolution of 1945: Roosevelt, Ho Chi Minh and de Gaulle in a world at war](#), SAGE Publications, London, pp.92-93.

Our ancestor Ông Vũ Huy Thắng wrote our family history that included our ancestors who passed the triennial Huong exam. Yet there was missing information such as the birth and death years to add to the genealogy of our family, except for the age and the regnal year in which our ancestors passed the Huong exam.

We begin by describing the difficulty and prestige of the triennial Huong exam in Vietnam history, and in particular the small number of laureates, based on history books, such as the excerpt below from Section [Mandarins and village literati](#):

“Traditionally it was **an honour for a village to have given birth to a mandarin**. Villagers would do all in their might to support the education of talented young boys. Thousands could sit for the regional exams held every **third year**. They were open to all males, but **only a tiny minority would pass**. **Among those who did, only a handful would go on to manage the imperial examination**. The fortunate few who did become mandarins would know how to remunerate their native village for the help they had received.”

Below is how we deduced the birth year of these ancestors, taking one ancestor as an example.

In addition, we provide a simple explanation for non-mathematical readers on why there are 60 years in a cycle of [Lunar \(Chinese\) calendar](#) year names (click to jump to Section [Lunar \(Chinese\) calendar](#)).

Family history: A Huong-exam laureate

Cụ Huy-Trình **26 tuổi** đỗ Tam-Trường khoa (thi) Huong, năm **Giáp Ngọ**, niên hiệu **Cánh-Hung 25**.

Our ancestor Huy-Trình passed the triennial **Huong exam** at the **age of 26**, Lunar year **Giáp Ngọ**, **25th regnal year Cánh-Hung**.

Mandarins and village literati

[Tønnesson, Stein](#) (1991), [The Vietnamese Revolution of 1945: Roosevelt, Ho Chi Minh and de Gaulle in a world at war](#), SAGE Publications, London. [Read this book](#) at the Norwegian National Library.

> p.92, my pdf p.106 (Norwegian National Library pdf p.[107](#)):

... the ancient role of the literati ('*lettres*') in Viet society. Most of the literati never became mandarins. Only those who passed the Confucian exams, first on the regional level, and then on the imperial level, and who were subsequently appointed to the service of the Emperor, became mandarins. The many who sat for exams, but did not pass, or managed only the regional level, remained literati.

Traditionally it was **an honour for a village to have given birth to a mandarin**. Villagers would do all in their might to support the education of talented young boys. **Thousands could sit for the regional exams held every third year**. They were open to all males, but only a tiny minority would pass. **Among those who did, only a handful would go on to manage the imperial examination.** {62} The fortunate few who did become mandarins would know how to remunerate their native village for the help they had received. ...

Even if a village would always hope that its sons would pass the exams, one who failed often served his village more directly than one who succeeded. In preparing for the exams, the young man had acquired knowledge in the classics and proficiency in the art of reading and writing. As a village-based literati, he would take care of administrative duties, correspond with the mandarins on behalf of the village council, use his ethical expertise to mediate in disputes, practise medicine or astrology, and serve as school teacher, thereby influencing the young generation. According to Alexander Woodside, Viet society was unique in Southeast Asia, and also in relation to China, for having a provincial intelligentsia, 'an aspirant ruling class, or ruling-class-in-waiting, domiciled in its villages ... close to the peasants'.

{62} **Altogether, a little over 2,000 received the highest degree**, from the institution of the system in 1075 to the last exams in 1919. Nguyen Khac Vien, 'Confucianisme et marxisme', in J. Chesneaux. G. Boudarel, D. Hémery (eds.). *Tradition et révolution au Vietnam*, p. 23 (Members of theatre troupes [sic, should be "troupes"] were excluded from the right to participate in exams.) According to Daniel Hémery, there were, around 1880, between 40,000 and 60,000 literati, 20,000 of whom had passed the lowest degree: D. Hémery. *Ho Chi Minh*, p. 26.

Analysis on the number of laureates

[NOTE: 2024.02.04 - The "20,000 of whom had passed the lowest degree" around 1880, as mentioned above, included all those (dead or alive) who had passed the Huong exam from 1075 (11th century) up to 1880 (19th century). But in [1813 \(Internet archived 2023.04.07\)](#), there were only nine (9) laureates of the Huong exam among all students coming from a large area of Vietnam, from Quảng Bình province in central Vietnam to Gia Định province in south Vietnam. There were $1880 - 1075 + 1 = 806$ years between 1075 and 1880, and the Huong exam was organized every three years. So the average number of Huong laureates per exam was $20000 / 806 * 3 = 74$, which is much larger than nine (9) !?

According to the book [Quốc triều Huong khoa lục, Cao Xuân Dục](#) (or a newer printing [Quốc triều hương khoa lục - Cao Xuân Dục](#)), there were 5,226 laureates in 47 Huong exams, and thus on average $5226 / 47 = 111$ laureates per exam. So the French historian David Hémery was probably right. It is possible that in 1813, there were more than one Huong exam campuses, among which the Quảng-Đức exam campus in July [1813 \(Internet archived 2023.04.07\)](#) was probably only one among several others. The total number of laureates ENDNOTE]

Literati = Sĩ tử, students who sat the Huong (regional) exam, whereas Công sĩ were students who passed the Huong exam, and went on to the capital (Hue) to take the Hoi exam. See [Thi Huong – Wikipedia tiếng Việt](#).

The triennial Hương exam

Every three years, the Vietnamese royal court organized three **highly-selective** national examinations to recruit able scholars, who passed any of these three national exams, to serve in the local or national government as mandarins (civil servants).

The first of these three national exams was called the “Hương” exam ([Thi Hương – Wikipedia tiếng Việt](#)), organized at a few (maybe only two) regional campuses in the country, (see photo of the Nam-Định exam campus in 1900) with each campus having its exam takers coming from several neighboring provinces.

Nam-Định “Hương” exam campus



[File:Cảnh lều chõng tai trường thi Nam Định, khoa thi Hương năm Canh Tý \(1900\).jpg - Wikipedia](#)
[Confucian court examination system in Vietnam - Wikipedia](#)

Scene of tents at Nam-Định exam school, Hương exam in the year of the Rat (1900).

Le Concours triennal des Lettrés d'Annam - Le camp des candidats à Nam-Dinh.

Le Concours triennal des Lettrés d'Annam :

= “The three-year competition for scholars of Annam” (machine translation)

= The **triennial** examination for Vietnamese scholars and civil servants, i.e., mandarins (human translation)

Campus = khuôn viên đại học, chõ chánh.

To give an idea how selective these national exams were, in July [1813](#) ([Internet archived 2023.04.07](#)), of the Lunar year “Quý Dậu”, 12th regnal year “Gia Long,” the “Hương” exam at the Quảng-Đức exam campus, which was later renamed as the Thừa-Thiên exam campus (where the royal city Hué is located), had only **nine laureates** out of all scholars coming from **eight different provinces**, arranged below **from north to south** as follows:

1. [Quảng Bình](#) ([Đồng Hới](#) capital city, Coordinates: [17°28'59"N 106°35'59"E](#), north of 17th parallel)
2. [Quảng Trị](#) (north of [Thừa-Thiên Hué Province](#))
3. [Quảng Nam](#) (south of [Thừa-Thiên Hué Province](#))
4. [Quảng Ngãi](#)
5. [Bình Định](#)
6. [Phú Yên](#)
7. [Khánh Hòa](#)
8. [Gia Định](#) (now [Ho Chi Minh municipality](#), Coordinates: [10°46'32"N 106°42'07"E](#), north of 10th parallel).

These eight provinces formed a **huge area of Vietnam**. As a result, the Thừa-Thiên exam campus together with the Nam-Dinh exam campus mentioned above, should be enough to cover all provinces of Vietnam at the time.

Provinces of Vietnam

2.1. [Quảng Bình](#) Province, [Đồng Hới](#) capital city

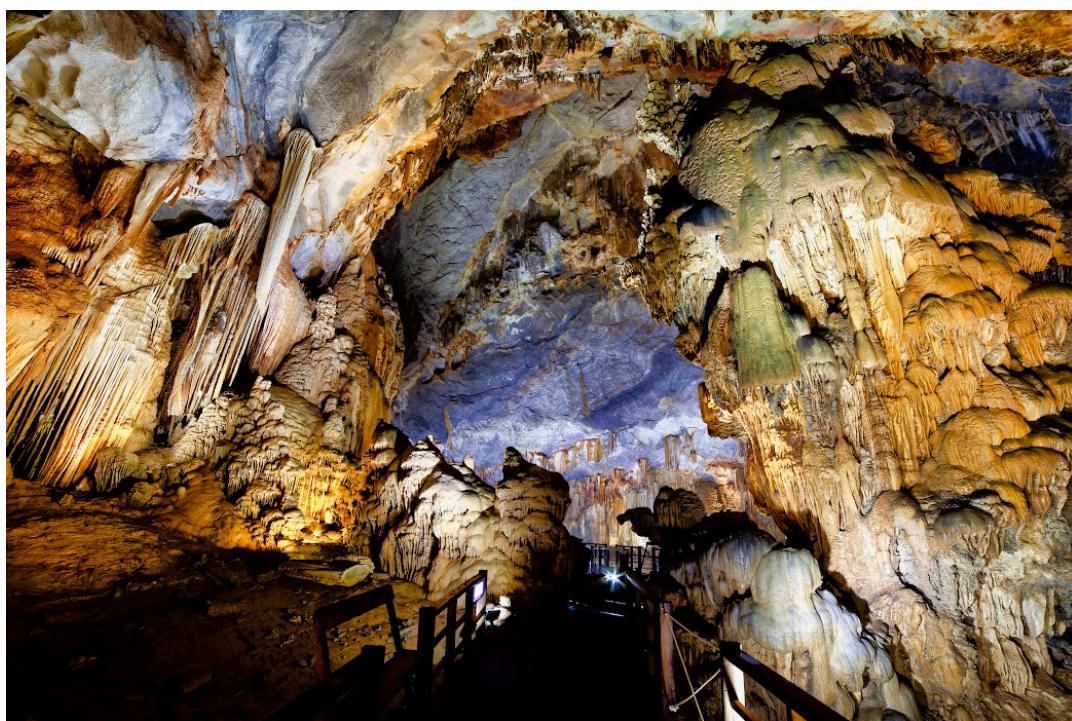


[Phong Nha-Ke Bang National Park, Quảng Bình province - Wikipedia](#)

Phong Nha - Kẻ Bàng national park

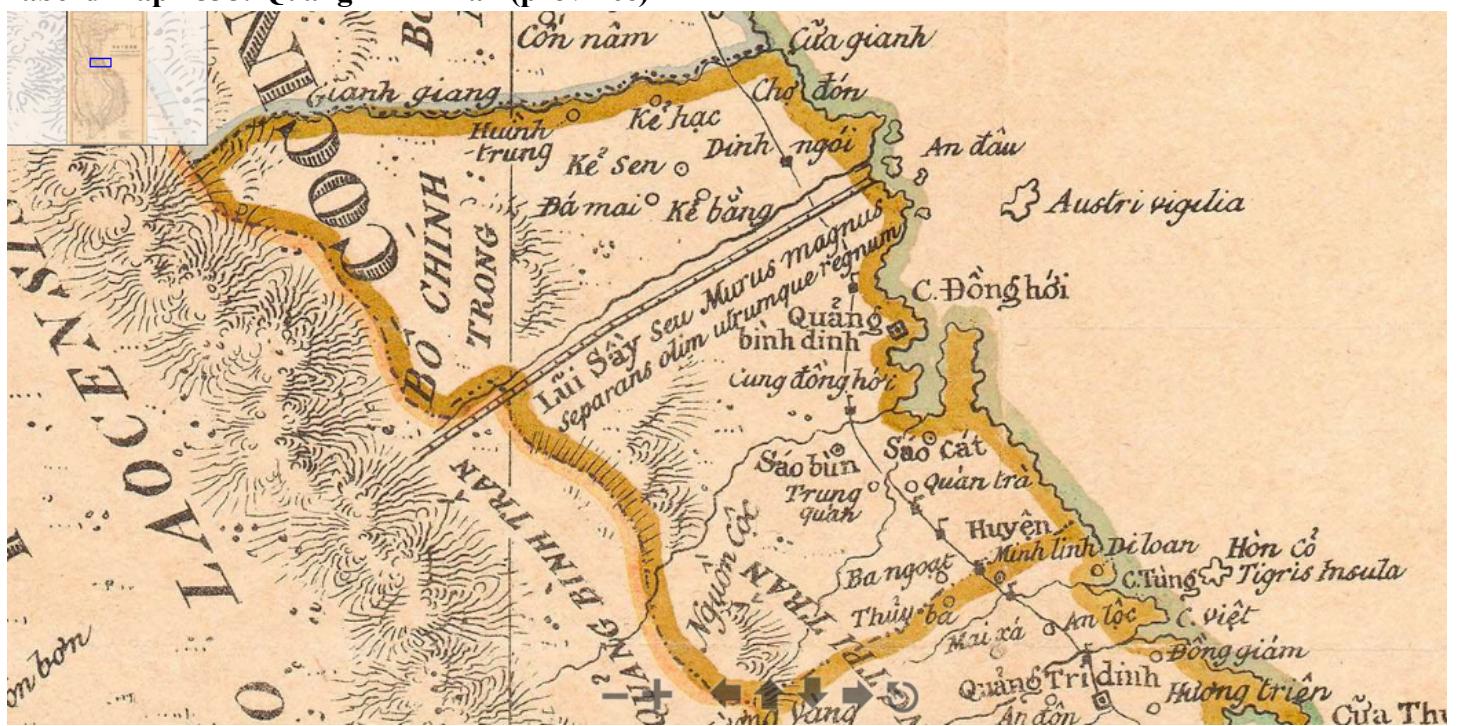
[Phong Nha - Ke Bang National Park: The splendid cave kingdom in Quang Binh](#)





Photos by Hung Vu, 2011

Taberd map 1838: Quảng Bình Trấn (province)



NOTE: For the meaning of “Lũi Sây,” which was an incorrect pronunciation and spelling of “Lũi Thầy,” meaning “The Wall built by the Teacher,” see the document [Notes on Vietnam history, Internet Archive](#). The Latin phrase “seu Murus magnus separans olim ulrumque regnum” means “or the Great Wall separating the former kingdom,” as annotated in the caption of Fig.8 in the scholarly written article by the former American diplomat [Meinheit, Harold E. \(2016\), The Bishop's Map Vietnamese and Western Cartography Converge, in The Portolan, Winter, pp. 28-40, Washington Map Society, Internet archived on 2023.12.10, p.37 \(or pdf p.10\)](#). The “Bishop's Map” is the map by [Jean-Louis Taberd](#), who was “Bishop of the [titular see](#) of Isaupolis in 1830”.

1838 Taberd Map of Vietnam - synthesis of Vietnamese and Western Cartography

Description

Known as the 'Bishop's Map', this is an exceptional and important 1838 map of Vietnam by Jean-Louis Taberd, a French missionary. Printed in Calcutta, India, the map is based on Taberd's roughly 10 years of missionary work in Cochinchina, modern-day southern Vietnam, under the Nguyễn Emperors, and is thus the first major advancement on Vietnamese cartography since the 1653 Alexander de Rhodes map of northern Vietnam. The map illustrates the Nguyễn Empire at the height of its power and influence, nearly half a century before the French interventions and subsequent colonization known as 'French Indochina'.

A closer look

The map illustrates the expansive claims of the Annamese Empire at its height, reaching west to just beyond Tonle Sap Lake, where it meets the Siamese border, thus embracing most of modern-day Cambodia and Laos. Cartographically it is a synthesis of Vietnamese administrative cartography and western techniques. To make the map, Taberd consulted with Vietnamese 'chain and compass engineers' who mapped the Mekong in great detail, bringing its full extent to western maps for the first time. Similar efforts allowed him to place with reasonable accuracy Vietnamese forts and settlements throughout. While he lamented the Vietnamese refusal to embrace western cartographic norms, such as longitude and latitude, he argued that his unique synthesis of styles produced 'the best and most detailed map that had yet appeared.'

The Great Wall

Many early maps of Vietnam include a long 'Great Wall of China' style wall in Quảng Ngãi province separating north and south Vietnam, or in this case the Trịnh and Nguyễn, respectively. The 1819 wall was built by Lê Văn Duyệt (1763/4-1832), a general in service to Gia Long, ostensibly to protect villages from upland minority raids. Although it appeared on several early maps, the wall quickly became overgrown and was forgotten until rediscovered in 2005 by archeologists of the [École Française d'Extrême-Orient](#). New research suggests that the construction of the wall was not as one-sided as it may seem. Although surviving written references to the wall are exclusively in the Viet tradition, it is likely to have been a joint effort by both the Viet and Hré peoples to create a secure defined border to mutual benefit.

[NOTE: The “long 'Great Wall of China' style wall in Quảng Ngãi province” or “[Trường Lũy Quảng Ngãi](#)” ([Long wall of Quang Ngai](#)) is not the wall denoted as “Lũy Sây” in Quảng Bình province in the Taberd map. See more explanation in [Notes On Vietnam History, Internet Archive](#). ENDNOTE]

Historical context

The map illustrates Vietnam at the end of Emperor Gia Long's reign (1762-1820) and in the early days of Minh Mạng's reign (1791-1841). French missionaries were well treated by Gia Long, but Minh Mạng despised and feared them. By 1833, he had either banished or executed most active missionaries, including Taberd, who fled to Calcutta. Where Gia Long was a great conqueror, Minh Mạng was a great consolidator, bringing his predecessors conquests under central administrative control on the Chinese tributary model. By the end of Gia Long's reign, there remained only two great powers in Southeast Asia: Siam and Vietnam. The smaller countries between, the declining Khmer Empire of Cambodia and the Kingdom of Laos, were fully absorbed by the larger empires. In conquered Cambodia, we see old Khmer names replaced by Vietnamese prefectures and a new capital has been established at Nam Vang Thành (Phnom Penh).

Cartographer

Jean-Louis Taberd (June 18, 1794 - July 31, 1840) was a French missionary active in Vietnam in the early 19th century. Taberd was born in Saint-Étienne, France, and ordained priest in Lyon in 1817. In 1820, he joined the La Société des Missions Etrangères de Paris, who appointed him to Cochinchina - part of modern-day [south] Vietnam. He became the Vicar Apostolic of Cochinchina in 1827, in 1830 Bishop of the

titular see of Isaropolis (a defunct bishopric in Turkey), and in 1838 the Vicar Apostolic of Bengal. In 1825, the Emperor of Vietnam, Minh Mạng (1791 - 1841) banned all missionaries. Those that remained, mostly French Catholics, were in constant danger. Between 1833 and 1838, no less than seven were sentenced to death. Taberd fled in the early 1830s to [Penang](#) [a state in Malaysia], then Calcutta. There, 1838, he published his famous Latin-Vietnamese dictionary, *Dictionarium Anamitico-Latinum*. Taberd died in Calcutta. Although Taberd did not return to Vietnam, in the late 19th century the Catholic college Institut Taberd was founded in Saigon by the Brothers of the Christian Schools and, since 1943, educated the Vietnamese elite.

2.2. [Quảng Trị](#) Province, Đông Hà capital city



Map [Quảng Trị Province, Provinces of Vietnam - Google My Maps](#)

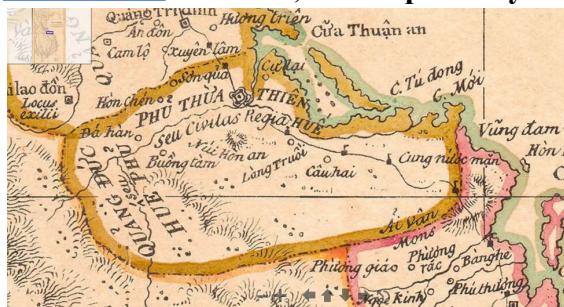
[Bến Hải River, Hiền Lương bridge \(17th parallel\), Quảng Trị province - Wikipedia](#)

Taberd map 1838: Quảng Trị Trấn (province)



[1838 Taberd Map of Vietnam - synthesis of Vietnamese and Western Cartography](#)

Thừa Thiên Province, Huế capital city



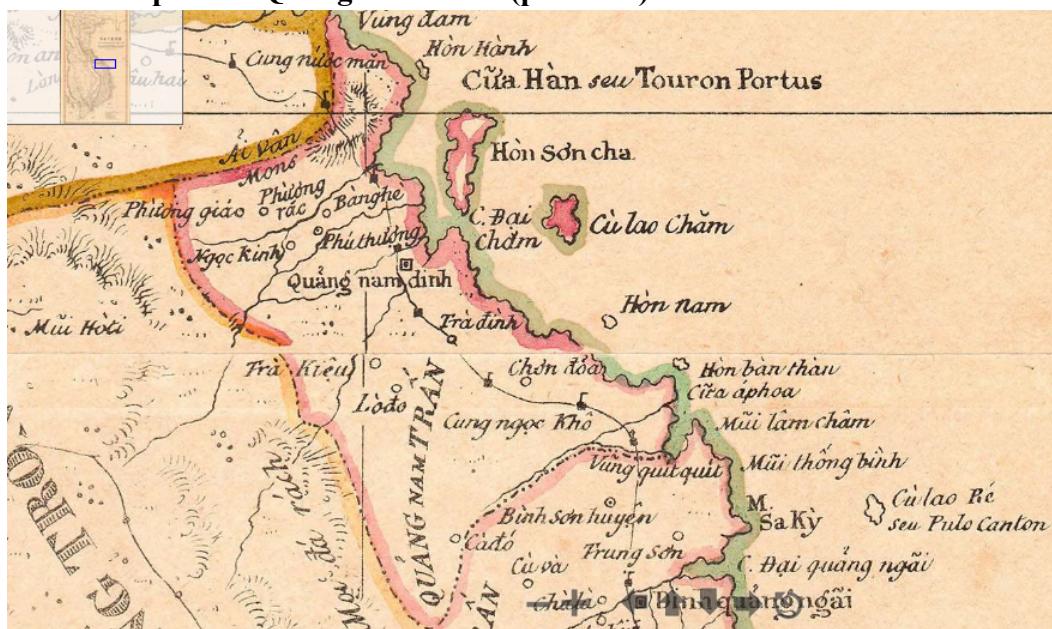
1838 Taberd Map of Vietnam - synthesis of Vietnamese and Western Cartography Danh sách các tỉnh Miền Trung Việt Nam

2.3. Quảng Nam Province, Tam Kỳ capital city



Boat by the water - Hoi An, Quảng Nam province - Wikipedia

Taberd map 1838: Quảng Nam Trấn (province)



1838 Taberd Map of Vietnam - synthesis of Vietnamese and Western Cartography

Map [Quảng Nam Province, Provinces of Vietnam - Google My Maps](#)
[Administration map of Quangnam province, Quảng Nam province - Wikipedia](#)

2.4. [Quảng Ngãi Province, Quảng Ngãi capital city](#)

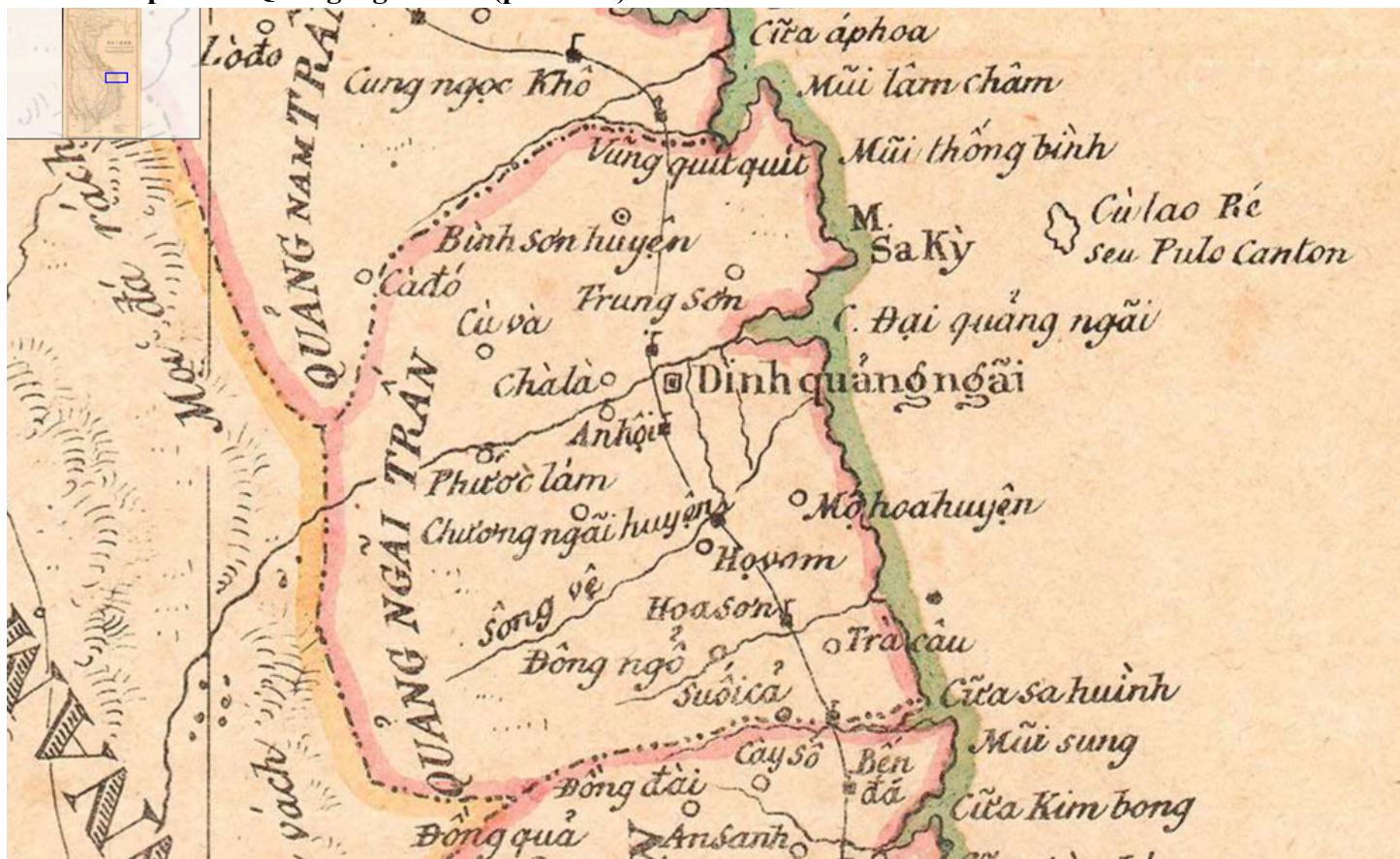


[Monument of the My Lai Massacre, Quảng Ngãi province - Wikipedia](#)



[Lý Sơn island, Quảng Ngãi province - Wikipedia](#)

Taberd map 1838: Quảng Ngãi Trấn (province)



[1838 Taberd Map of Vietnam - synthesis of Vietnamese and Western Cartography](#)

2.5. Bình Định province, Quy Nhơn capital city



Map Bình Định province, Provinces of Vietnam - Google My Maps

Image 2 and Image 3 (below): Cham towers near Quy Nhon (photos by Uyen)

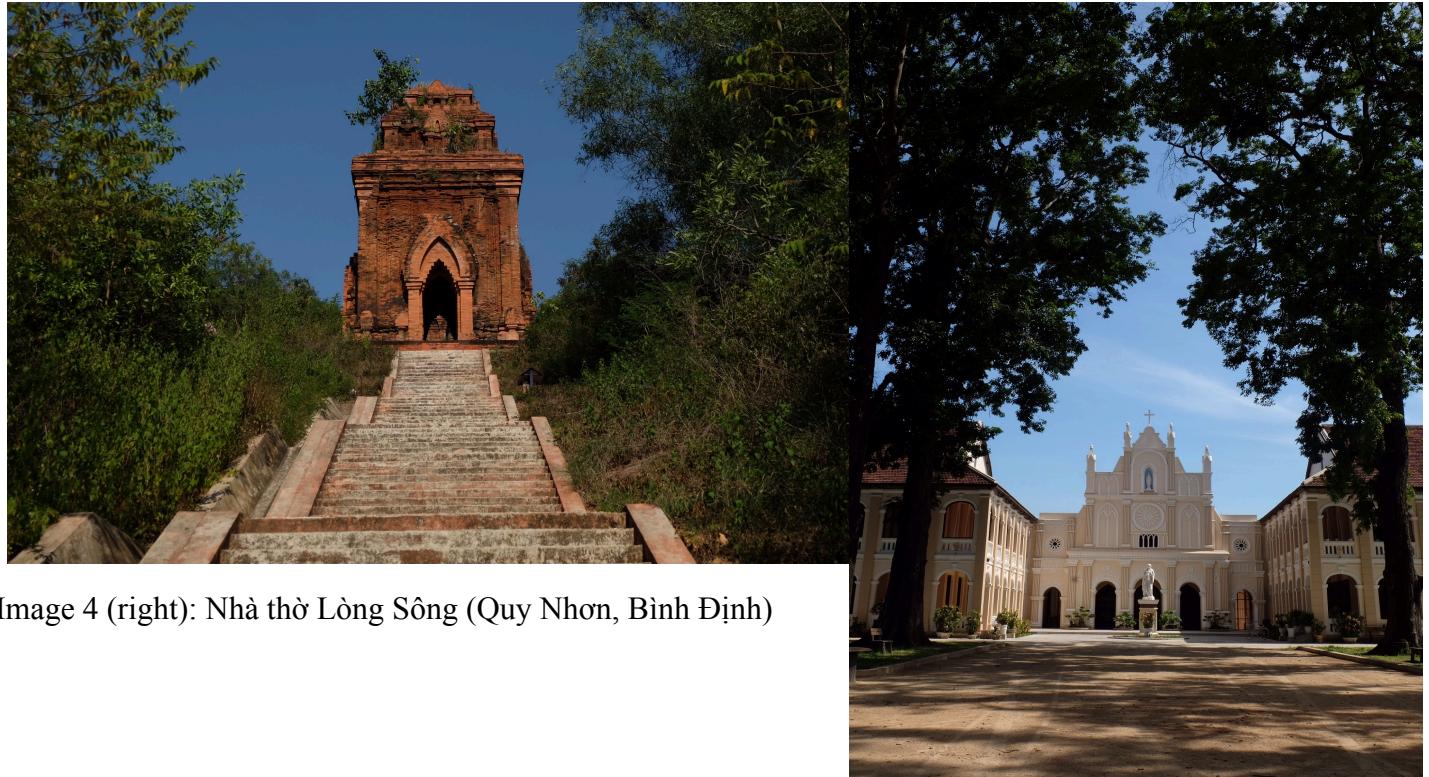
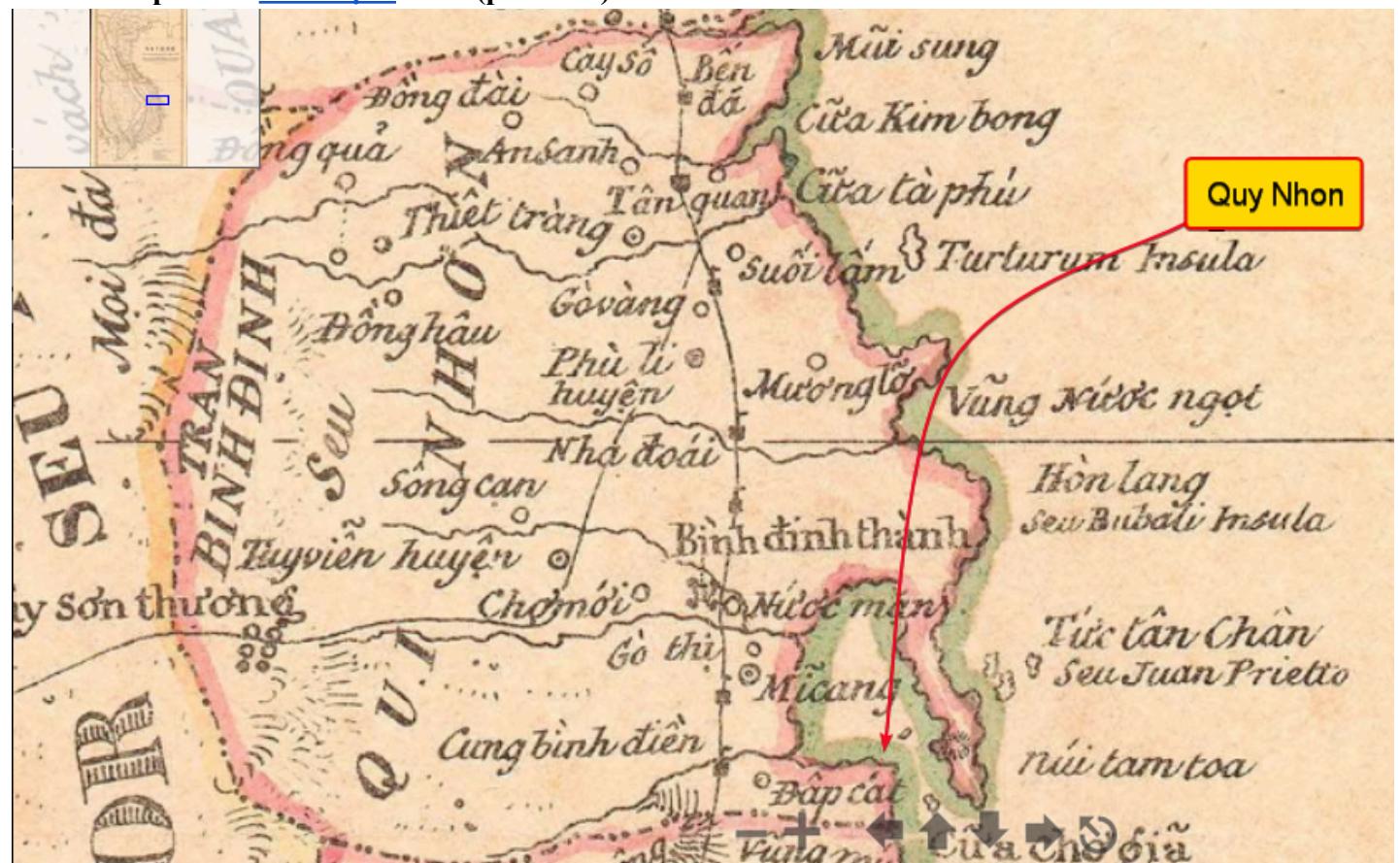


Image 4 (right): Nhà thờ Lòng Sông (Quy Nhơn, Bình Định)

Taberd map 1838: [Bình Định](#) Trân (province)



1838 Taberd Map of Vietnam : Trân Bình Định, Qui Nhơn (or Quy Nhon).

[Bình Định province - Wikipedia](#) Map

[TIỀU SỬ VÀ SỰ NGHIỆP VUA QUANG TRUNG - NGUYỄN HUỆ \(1752-1792\)](#)

[Bình Định province - Wikipedia](#)

Tây Sơn Dynasty[edit | edit source]

The [Tây Sơn dynasty](#) originated from Bình Định, being named after Tây Sơn district where the rulers had come from.^[7] The capital of Quy Nhơn served as their capital until the [Vietnamese Civil War of 1789–1802](#), when the province was wracked by warfare and the dynasty collapsed.

Its Sino-Vietnamese name [i.e., [Bình Định](#)] ([Hán tự](#): [平定](#)) translates as "pacified" or "subjugated."



[View of the beach at Quy Nhơn, Vietnam, in January 2008, Bình Định province - Wikipedia](#)

Comparing the [Google Maps of Quy Nhơn](#) to the [1838 Taberd Map](#) of Bình Định province, the city Quy Nhơn is likely near “Đập cát” on the [1838 Taberd Map](#) (Quy Nhơn harbor, Vịnh Quy Nhơn, [Google Maps](#)).

2.6. [Phú Yên Province](#), Tuy Hòa capital city

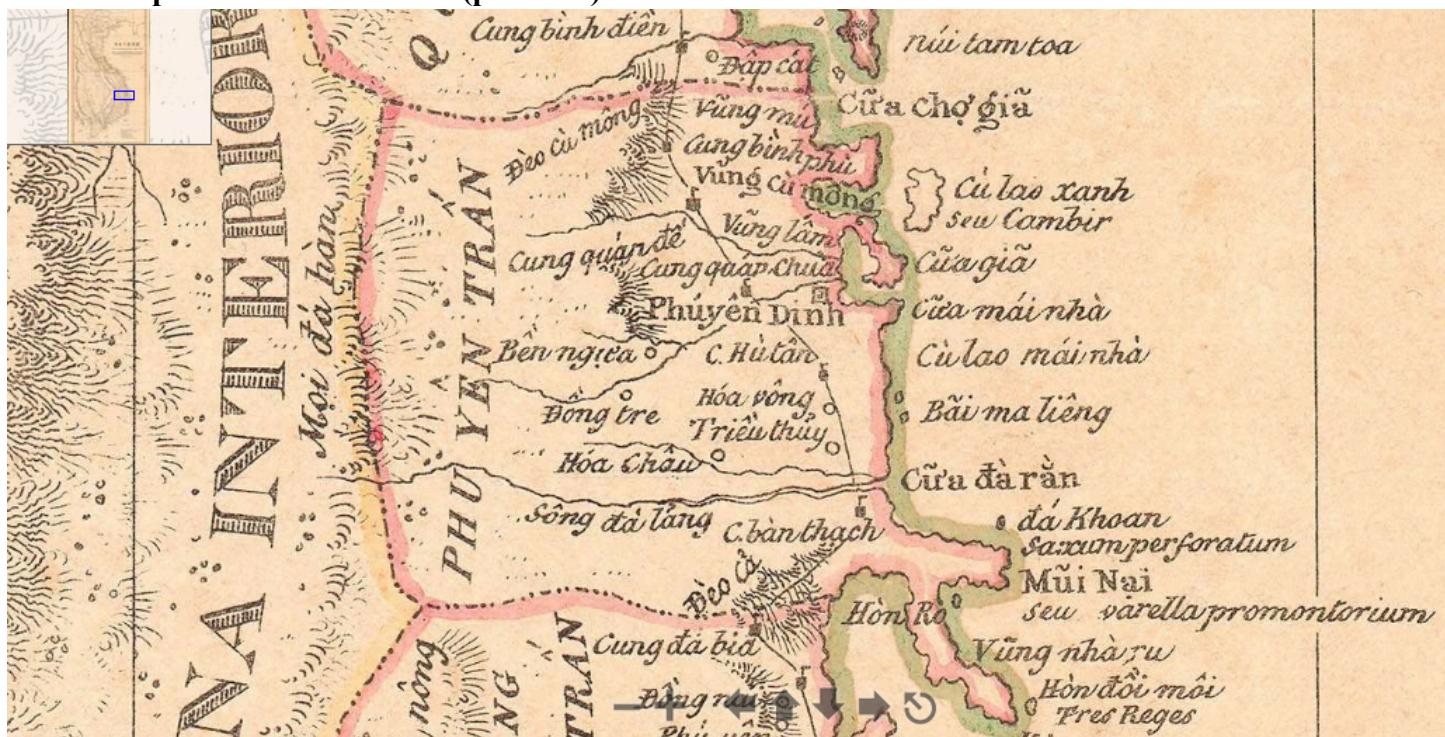


Map [Phú Yên Province, Provinces of Vietnam - Google My Maps](#)

[Coral reef in swiftlet island, Tuy An, Phú Yên province - Wikipedia](#)

Swiftlet = chim yến

Taberd map 1838: Phú Yên Trấn (province)



[1838 Taberd Map of Vietnam - synthesis of Vietnamese and Western Cartography](#)

2.7. Khánh Hòa Province, Nha Trang capital city



[A beach in Nha Trang, Khanh Hòa province - Wikipedia](#)

Map [Khánh Hòa Province, Nha Trang capital city, Provinces of Vietnam - Google My Maps](#)

Taberd map 1838: Bình Hòa Trấn (province)

NOTE: "Bình Hòa" may be a former name of the nowadays "Khánh Hòa".



[1838 Taberd Map of Vietnam - synthesis of Vietnamese and Western Cartography](#)



[Evason Hideaway Resort, Ninh Hoa, Khánh Hòa province - Wikipedia](#)



Khanh Hòa sẽ là thành phố trực thuộc trung ương thứ 6 của cả nước (Khanh Hòa will become the sixth municipality of Vietnam).

“Thành phố trực thuộc trung ương” means “city under a central administration,” with the administrative status of a province. These cities are called “municipalities” in English.

As of 2023.10.29 (at the time of this writing), there are five [municipalities in Vietnam](#) (with Khanh Hòa planned to become the sixth municipality by 2030 according to the above article):

1. [Hanoi \(Hà Nội\)](#)
2. [Haiphong \(Hải Phòng\)](#)
3. [Da Nang \(Đà Nẵng\)](#)
4. [Ho Chi Minh City \(Thành phố Hồ Chí Minh\)](#)
5. [Cần Thơ \(Cần Thơ\)](#)



[Municipalities of Vietnam - Wikipedia](#)

On the first tier, Vietnam is divided into 58 [provinces](#) (Vietnamese: *tỉnh*) and 5 municipalities (Vietnamese: *thành phố trực thuộc trung ương*). Municipalities are the highest-ranked cities in Vietnam.¹¹ Municipalities are centrally-controlled cities and have special status equal to the [province](#).



2.8. Gia Định province

The Gia Định province was one of the six provinces of Cochinchina, known in Vietnamese as Nam Kỳ Lục Tỉnh (Nam Kỳ = Cochinchina, Lục = six, Tỉnh = provinces).



Left: [Six provinces in south Vietnam at the beginning of the Nguyen Dynasty to 1841](#)

Right: [Vung Tau \(Cap St Jacques\), Bien Hoa province](#)

Vung Tau (Cap St Jacques)

[Vũng Tàu - Wikipedia](#)



Taberd map 1838: Gia Định Phủ (province)



[1838 Taberd Map of Vietnam - synthesis of Vietnamese and Western Cartography](#)

[Nam Kỳ Lục tỉnh – Wikipedia tiếng Việt](#)

In the 19th century, the name of south Vietnam was “Six provinces of South Vietnam” (**Nam Kỳ Lục tỉnh**) under the Nguyen Dynasty from 1832 to 1862 (when the French colonialists took the three provinces in the east) and to 1867 (when the French took the remaining three provinces in the west). From then on, the French called this area as Basse-Cochinchine.

[Gia Định province - Wikipedia](#)

In 1832, the Gia Định province was established under the reign of king Minh Mang of the Nguyen dynasty. Then in 1889, the Gia Dinh province was split into four smaller provinces: Gia Định (itself became smaller), [Chợ Lớn](#), [Tân An](#), and [Tây Ninh](#). All three provinces—Gia Định (itself became smaller), [Chợ Lớn](#), [Tân An](#)—are now part of the Ho Chi Minh municipality. Only [Tây Ninh](#) remains as a province since the split.

[NOTE: This English Wikipedia article does not provide a detailed description of the Gia Dinh province, but gives an idea on when the province was established. See also [Municipalities of Vietnam - Wikipedia](#) referred to above. ENDNOTE]



[Hydrofoil Fast Ferry Station, an architectural landmark, Vũng Tàu - Wikipedia](#)

Method to deduce the birth year of Hương exam laureates

Recall from Section [Family history: A Hương-exam laureate](#) in the [Introduction](#) that “Our ancestor Huy-Trình passed the triennial Hương exam at the age of 26, Lunar year Giáp Ngọ, 25th regnal year Cảnh-Hung.”

“Cảnh-Hung” = prosperous country

The title “Cảnh-Hung” could be translated as “prosperous scenery,” or better yet “prosperous country.”

Cảnh = Scenery, country

In the Sino-Vietnamese dictionary by Dao Duy Anh, the translation of “Cảnh” is given as:

CẢNH 警 Phòng giữ – Báo tin nguy cấp
– Đánh thức dậy – Ngầm cho biết –
Gọi tắt chữ cảnh sát, vd. Quân-cảnh –
Lanh lẹ. Vd. Cơ-cảnh.
– 頸 Phía trước cái cổ.
– 景 Tưởng mến – Vé ánh sáng – Hình
sắc có ý tứ. Vd. Phong cảnh – Sáng lớn
– Cũng có nghĩa như chữ 境
– 境 Bờ cõi – Cảnh minh gấp. Vd.
Thuận-cảnh – Phong cảnh, vd. Giai
cảnh – Trình-dộ, Vd. Tiến-cảnh.

There are different Chinese characters that are pronounced the same as “Cảnh” but have different meanings; these words are called “[homophones](#)”. One homophone “Cảnh” has the meaning of “bờ cõi,” which can be translated into English as “boundary,” but could be used to [mean](#) “territory” or “country” within the “boundary.”

Another homophone “Cảnh” has the meaning of “phong cảnh,” which is translated as “scenery.”

Hung = prosperous

[Han-Viet Tu Dien, Dao Duy Anh](#), pdf p.346

HƯNG 興 Nổi lên – Phát ra – Thịnh
vượng.

- *thịnh* – 盛 Thịnh-vượng (prospérité).

Thus “Hung” means “prosperity.”

Regnal years “Cảnh-Hung”

The web search for “[niên hiệu Cảnh-Hung](#)” brought up two Vietnamese kings:

- [Lê Hiển Tông – Wikipedia tiếng Việt](#) (with “[hook above](#)” the letter “ê” in the middle name “[Hiển](#)”), 1717-1786, thus an 18th-century king, whose regnal years were named “[Cảnh-Hung](#).”
- [Lê Hiến Tông – Wikipedia tiếng Việt](#) (with “[acute accent](#)” above the letter “ê” in the middle name “[Hiến](#)”), 1461-1504, thus a 15th-16th century king, whose regnal years were named “Cảnh Thống.”

NOTE: Regarding the tone marks (e.g., [acute accent](#), [hook above](#), etc) in the [Vietnamese alphabet](#), see Section “[Tone marks](#)” in [Vietnamese alphabet - Wikipedia](#). ENDNOTE

So in order of their birth year:

[Lê Hiển Tông – Wikipedia tiếng Việt](#)

Lê Hiển Tông (chữ Hán: 黎憲宗 6 tháng 9 năm 1461 – 24 tháng 6 năm 1504) là vị hoàng đế thứ sáu của **Hoàng triều Lê** nướoc **Đại Việt**. Ông cai trị từ ngày **9 tháng 3** năm **1497** đến khi **qua đời**, tổng cộng 7 năm với niên hiệu là **Cánh Thống**.

Lê Hiển Tông – Wikipedia tiếng Việt

Lê Hiển Tông (chữ Hán: 黎顯宗 20 tháng 5 năm 1717 – 10 tháng 8 năm 1786), **tên húy** là **Lê Duy Diêu** (黎維祿), là vị **hoàng đế** áp chót của **nhà Lê Trung hưng** cũng như là thứ 26 của **nhà Hậu Lê** trong **lịch sử Việt Nam**. Ông ở ngôi từ tháng 5 năm **1740**, sau khi **Trịnh Doanh** ép vua **Lê Ý Tông** nhường ngôi cho ông, đến ngày **17 tháng 7** năm **1786**.¹¹ Trong suốt thời gian trị vì ông chỉ dùng một niên hiệu là **Cánh Hưng**.

25th regnal year “Cánh Hưng”

The next step is to search for the **Gregorian year** (what we use nowadays) corresponding to the 25th regnal year “**Cánh Hưng**.” We need to know how to compute “**Cánh-Hưng 25**” into the **Gregorian calendar year**.

Search for the 25th regnal year “**Cánh Hưng**” under king **Lê Hiển Tông** (with “**hook above**” the letter “ê” in the middle name “**Hiển**”): **Năm thứ 25 đời Cánh Hưng Lê Hiển Tông**

Some articles we found:

[Chuyên lên ngôi kỳ la bắc nhất lịch sử của vua Lê Hiển Tông](#)

[Giai thoại kỳ thú về niên hiệu Cánh Hưng của vua Hậu Lê](#)

But in the above two articles, there was no mention of how to compute the “**Cánh-Hưng 25**”

Below are better articles to **connect the first regnal year to the Gregorian year**.

For the first Nguyễn king with regnal year title “**Gia Long**,” 1802 was the first regnal year “**Gia Long**”:

[Gia Long - Vì Hoàng đế đầu tiên sáng lập vương triều Nguyễn - triều đại phong kiến cuối cùng trong lịch sử Việt Nam. \(baotanglichsu.vn\)](#)

Năm 1802 khi đã lấy lại được toàn bộ đất đai cũ của các chúa Nguyễn, Nguyễn Ánh cho lập đàn tế cáo trời đất, thiết triều tại Phú Xuân, đặt niên hiệu là **Gia Long** năm thứ nhất.

Từ Nguyễn Ánh đến vua Gia Long (Bài 1) | Nghiên Cứu Lịch Sử (nghiencuulichsu.com)

Nguyễn Ánh đã lên ngôi và lấy **niên hiệu** là **Gia Long** vào năm **1802** (Gia Long năm thứ nhất).

Best article showing the correspondence (computation) of the **regnal year** (niên hiệu) and the **Gregorian year**:
[Viên nghiên cứu Hán nôm \(hannom.org.vn\)](#)

4. Đạo thứ tư ghi ngày 24 tháng 7 Cánh Hưng thứ 1 (1740), đời vua Lê Hiển Tông.

Tên thần ghi là: Ông Ba Đại vương 翁巴大王.

5. Đạo thứ năm ghi ngày 8 tháng 8 Cánh Hưng thứ 28 (1767), đời vua Lê Hiển Tông.

Tên thần ghi là: Ông Ba Đại vương 翁巴大王.

6. Đạo thứ sáu ghi ngày 16 tháng 5 Cánh Hưng thứ 4 (1783), đời vua Lê Hiển Tông.

Tên thần ghi là: Ông Ba Đại vương 翁巴大王.

7. Đạo thứ bảy ghi ngày 26 tháng 7 Cánh Hưng thứ 44 (1783), đời vua Lê Hiển Tông.

Tên thần ghi là: Ông Ba Đại vương 翁巴大王.

So the 28th regnal year “**Cánh-Hưng**” was **1767**, and thus the 25th regnal year “**Cánh-Hưng**” should be **1764**.

There was a misprint in the regnal year number “Cảnh Hưng thứ 4” in the line
“6. Đạo thứ sáu ghi ngày 16 tháng 5 Cảnh Hưng thứ 4 (1783), đời vua Lê Hiển Tông.”

This regnal year number should be 44, as computed below, with 1740 being the regnal year 1:
 $1783 - 1740 + 1 = 44$

In [Viên nghiên cứu Hán nôm \(hannom.org.vn\)](#), the clause “Đạo sắc phong” was used in several sentences such as “Đình làng Nguyệt Áng thờ Ông Ba Đại vương, tương truyền thần là con trai thứ ba của Kinh Dương Vương. ... Đến ngày 12 tháng 2 năm Bính Ngọ (?) Ông Ba Đại vương thác hóa về trời, dân làng Nguyệt Áng liền lập bài vị thờ ngài, quanh năm hương hỏa không bao giờ dứt. Các triều vua đều ban cấp sắc phong cho phép thờ phụng. ... trong đình làng còn lưu giữ được 1 đạo sắc phong. Như vậy là đến năm 1938, đình làng Nguyệt Áng chỉ thấy có 1 đạo sắc phong. Gần đây do công việc xây dựng tôn tạo lại đình làng, nhân dân lại phát hiện ra 15 đạo sắc và một bǎn thần tích”

Search
[đạo sắc phong](#)

[Sắc phong là gì? Tìm hiểu về các đạo sắc phong](#)
[Sắc phong – Wikipedia tiếng Việt](#)

Đạo sắc phong = Document issued by the king to ordain someone as a local god, whom the village would worship.

Next, we check the Lunar year name of 1764:

[Năm 1764 là năm con gì, Mệnh gì, Màu gì? \(dichthuatphuongdong.com\)](#)

Năm 1764 là năm Giáp Thân theo lịch âm.

[Giáp Thân – Wikipedia tiếng Việt](#)

It turned out that 1764 is Lunar year “Giáp Thân”, but not “Giáp Ngọ”, as written in our family history.

[Giáp Ngọ – Wikipedia tiếng Việt](#)

Các năm Giáp Ngọ [[sửa](#) | [sửa mã nguồn](#)]

Giữa năm [1700](#) và [2200](#), những năm sau đây là năm Giáp Ngọ (lưu ý ngày được đưa ra được tính theo lịch Việt Nam, chưa được sử dụng trước năm 1967):

- [1714](#)
- [1774](#)
- [1834](#)

Around the year 1764, the Lunar year “Giáp Ngọ” corresponds to 1714, 1774, 1834, with 1774 separated from 1764 by ten years.

Why was there a mismatch? There are two possibilities:

- The Gregorian year 1764 was wrong.
- The Lunar year “Giáp Ngọ” was wrong.

Năm Giáp Ngọ = 1774

Cảnh-Hưng 25 = 1740 + 25 - 1 = 1764 = Năm Giáp Thân

Cảnh-Hưng 35 = 1740 + 35 - 1 = 1774 = Năm Giáp Ngọ

Lunar years for Huong exams

[Khoa bảng Việt Nam – Wikipedia tiếng Việt](#)

Khái quát

... cut ...

Từ thời Hậu Lê, việc thi cử được tiến hành đều đặn và quy củ. Các kỳ thi theo thứ tự là Thi Hương, Thi Hội, Thi Đình. Người đỗ đầu cả ba thì gọi là Tam Nguyên (như Tam Nguyên Nguyễn Khuyến).

Thi Hương được tổ chức mỗi 3 năm, vào các năm Tý, Ngo, Mão, Dậu.

From the article [Khoa bảng Việt Nam – Wikipedia tiếng Việt](#), the Hương exam (“Thi Hương”) was organized every 3 years, in the years with the *Terrestrial branches* “Tý, Ngo, Mão, Dậu”. So the Terrestrial branch “Ngo” does coincide with the year “Giáp Ngo” (1774).

So the Huong exams were not given in the Lunar years with the Terrestrial branch “Thân”, and thus not in the Lunar year “Giáp Thân” cannot be the year in which our ancestor passed the Huong exam. That year has to be “Giáp Ngo”, with 1774 being closest to 1767.

Misprint in our original family history

So the above analysis shows that the Lunar year “Giáp Ngo” in “Cảnh-Hung 35 = $1740 + 35 - 1 = 1774$ = Năm Giáp Ngo” was the correct year in which the Hương exam (“Thi Hương”) was organized, and in which our ancestor passed this exam.

On the other hand, the year “Giáp Thân” in “Cảnh-Hung 25 = $1740 + 25 - 1 = 1764$ = Năm Giáp Thân” was NOT the correct year in which the Hương exam (“Thi Hương”) was organized.

Hence there is a misprint in the number “25” (twenty five), which should be “35” (thirty five), i.e., the first digit “2” should be “3”. Thus our ancestor Huy-Trình passed the Hương exam in the Lunar year “Giáp Ngo,” which is the 35th regnal year “Cảnh-Hung,” abbreviated as “Cảnh-Hung 35,” not “Cảnh-Hung 25.”

Deduce ancestor birth year

Based on the above analysis, since our ancestor Huy-Trình passed the Hương exam in 1774 when he was 26 years old, his birth year would be $1774 - 26 = 1748$.

Lunar (Chinese) calendar

[The Chinese Calendar](#): The name of each year, e.g., Quý Mão, has two components: (1) The first component (Quý) is called the *Celestial stem* [or *Thiên can* in Vietnamese], which has 10 different stems (see [Heavenly stems - Wikipedia](#)) with no English equivalents (but with Vietnamese equivalents of course); (2) The second component is called *Terrestrial branch* [or *Địa chi* in Vietnamese]. See also [Chinese calendar - Wikipedia](#) ([Nông lịch – Wikipedia tiếng Việt](#)), [Sexagenary cycle - Wikipedia](#) ([Can Chi – Wikipedia tiếng Việt](#)).

Why any given year returns every 60 years

Celestial (Heavenly) stems = Thiên can

[Heavenly Stems - Wikipedia](#)

The ten **Heavenly Stems** or **Celestial Stems**¹¹ ([Chinese](#): 天干; [pinyin](#): *tiāngān*) are a Chinese system of [ordinals](#) that first appear during the [Shang dynasty](#), c. 1250 BCE, as the names of the ten days of the week. They were also used in Shang-period ritual as names for dead family members, who were offered sacrifices on the corresponding day of the Shang week. The Heavenly Stems were used in combination with the [Earthly Branches](#), a similar cycle of twelve days, to produce a compound [cycle of sixty days](#). Subsequently, the Heavenly Stems lost their original function as names for days of the week and dead kin, and acquired many other uses, the most prominent and long lasting of which was their use together with the Earthly Branches as a [60-year calendrical cycle](#).¹² The system is used throughout [East Asia](#).

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
Pinyin	jiǎ	yǐ	bǐng	dīng	wù	jǐ	gēng	xīn	rén	guǐ
Viet	giáp	át	bính	đinh	mậu	kỷ	canh	tân	nhâm	quý

Terrestrial branch = Địa chi

[Earthly Branches - Wikipedia](#)

The twelve **Earthly Branches** or **Terrestrial Branches**¹¹ are a [Chinese](#) ordering system used throughout [East Asia](#) in various contexts, including its [ancient dating system](#), [astrological traditions](#), [zodiac](#) and [ordinals](#).

	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Pinyin	zǐ	chǒu	yín	mǎo	chén	sì	wǔ	wèi	shēn	yǒu	xū	hài
Viet	tí	sửu	dần	mão	thìn	tị	ngọ	mùi	thân	dậu	tuất	hợi

Why a cycle of 60 years?

10 Celestial stems = C1, C2, ..., C10

12 Terrestrial branches = T1, T2, ..., T12

So why do we not have a cycle of $10 \times 12 = 120$ years ?

There are two methods of naming the lunar years:

- **Method 1:** For each Celestial stem, e.g., C1, list all 12 Terrestrial branches, e.g., Year 1 = C1 T1, Year 2 = C1 T2, Year 3 = C1 T3, etc. leading to a cycle of [120 years](#).
- **Method 2:** Both the Celestial stems and the Terrestrial branches are incremented by one simultaneously together: Year 1 = C1 T1, Year 2 = C2 T2, Year 3 = C3 T3, etc. leading to a cycle of [60 years](#). [Method 2 is the convention chosen for naming the lunar years](#). See Section [Life expectancy, why 60-year cycle](#).

Method 1 of naming years, cycle of 120 years

Year 1 = C1 T1, Year 2 = C1 T2, Year 3 = C1 T3, etc., Year 13 = C2 T1, Year 14 = C2 T2, etc.

Year 1	C1 = jiǎ = giáp	T1 = zǐ = tí
Year 2	C1 = jiǎ = giáp	T2 = chǒu = sǔu
Year 3	C1 = jiǎ = giáp	T3 = yín = dàn
...
Year 12	C1 = jiǎ = giáp	T12 = hài = hợi
Year 12 * 1 + 1 = 13	C2 = yǐ = át	T1 = zǐ = tí
Year = 13 + 1 = 14	C2 = yǐ = át	T2 = chǒu = sǔu
....
Year 13 + 11 = 24	C2 = yǐ = át	T12 = hài = hợi
Year 12 * 2 + 1 = 13 + 12 = 25	C3 = bǐng = bính	T1 = zǐ = tí
...
Year 12 * 3 + 1 = 25 + 12 = 37	C4 = dīng = đinh	T1 = zǐ = tí
...
Year 12 * 4 + 1 = 37 + 12 = 49	C5 = wù = mậu	T1 = zǐ = tí
...
Year 12 * 5 + 1 = 49 + 12 = 61	C6 = jǐ = ky	T1 = zǐ = tí
...
Year 12 * 6 + 1 = 61 + 12 = 73	C7 = gēng = canh	T1 = zǐ = tí
...
Year 12 * 7 + 1 = 73 + 12 = 85	C8 = xīn = tân	T1 = zǐ = tí
...
Year 12 * 8 + 1 = 85 + 12 = 97	C9 = rén = nhâm	T1 = zǐ = tí
...
Year 12 * 9 + 1 = 97 + 12 = 109	C10 = guǐ = quý	T1 = zǐ = tí
...
Year 109 + 11 = 120	C10 = guǐ = quý	T12 = hài = hợi
Year 121 = Year 1	C1 = jiǎ = giáp	T1 = zǐ = tí

Method 2 of naming years, cycle of 60 years

Year 1 = C1 T1, Year 2 = C2 T2, Year 10 = C10 T10, Year 11 = C1 T11, Year 12 = C2 T12, Year 13 = C3 T1, etc.

Period 1	Year 1	C1 = jiǎ = giáp	T1 = zǐ = tí
	Year 2	C2 = yǐ = át	T2 = chǒu = sưu
	Year 3	C3 = bǐng = bính	T3 = yín = dàn

	Year 9	C9 = rén = nhâm	T9 = shēn = thân
	Year 10	C10 = guǐ = quý	T10 = yǒu = dậu
Period 2	Year 11	C1 = jiǎ = giáp	T11 = xū = tuất
	Year 12	C2 = yǐ = át	T12 = hài = hợi
	Year 13	C3 = bǐng = bính	T1 = zǐ = tí

	Year 19	C9 = rén = nhâm	T7 = wǔ = ngọ
	Year 20	C10 = guǐ = quý	T8 = wèi = mùi
Period 3	Year 21	C1 = jiǎ = giáp	T9 = shēn = thân

	Year 30	C10 = guǐ = quý	T6 = sì = tị
Period 4	★ Year 31	C1 = jiǎ = giáp	T7 = wǔ = ngọ

	Year 40	C10 = guǐ = quý	T4 = mǎo = mão
Period 5	Year 41	C1 = jiǎ = giáp	T5 = chén = thìn

	Year 50	C10 = guǐ = quý	T2 = chǒu = sưu
Period 6	Year 51	C1 = jiǎ = giáp	T3 = yín = dàn

	Year 60	C10 = guǐ = quý	T12 = hài = hợi
Period 1	Year 61 = Year 1	C1 = jiǎ = giáp	T1 = zǐ = tí

10 x 6 = 60 : 10 Celestial stems (Thiên can) x 6 period of 10 years (giai đoạn 10 năm) = 60-year cycle (chu kỳ 60 năm)12 x 5 = 60 : 12 Terrestrial branches (Địa chi) x 5 period of 12 years (giai đoạn 12 năm) = 60-year cycle (chu kỳ 60 năm)

The common multiple of 12 and 10 is 60.

Sexagenary cycle

After the above explanation of the 60-year cycle, we found this [Sexagenary cycle - Wikipedia](#) article, where there is no clear explanation for non-mathematical beginners (the uninitiated) as done above, but contains extensive details for the initiated or mathematical-oriented readers.

Sexagenary, etymology

Sexagenary “comes from the Latin word *sexāgēnārius*, from *sexāgēnī*, meaning “sixty each,” from *sexāgintā*, “sixty.” The suffix -ary is used to indicate a person (as seen in common words like secretary).” See [SEXAGENARY Definition & Meaning | Dictionary.com](#) and also [sexagenary - Wiktionary, the free dictionary](#)

Sexagenary years, 60-year cycle

[Sexagenary cycle - Wikipedia](#) : The table below does NOT explain why “60” in the 60-year cycle.

Sexagenary cycle					
1 Wood Rat	2 Wood Ox [ja]	3 Fire Tiger [ja]	4 Fire Rabbit [ja]	5 Earth Dragon	6 Earth Snake [ja]
7 Metal Horse [ja]	8 Metal Goat [ja]	9 Water Monkey [ja]	10 Water Rooster [ja]	11 Wood Dog [ja]	12 Wood Pig [ja]
13 Fire Rat [ja]	14 Fire Ox [ja]	15 Earth Tiger [ja]	16 Earth Rabbit [ja]	17 Metal Dragon [ja]	18 Metal Snake [ja]
19 Water Horse [ja]	20 Water Goat [ja]	21 Wood Monkey [ja]	22 Wood Rooster [ja]	23 Fire Dog [ja]	24 Fire Pig [ja]
25 Earth Rat [ja]	26 Earth Ox [ja]	27 Metal Tiger [ja]	28 Metal Rabbit [ja]	29 Water Dragon [ja]	30 Water Snake [ja]
31 Wood Horse [ja]	32 Wood Goat [ja]	33 Fire Monkey [ja]	34 Fire Rooster [ja]	35 Earth Dog [ja]	36 Earth Pig [ja]
37 Metal Rat [ja]	38 Metal Ox [ja]	39 Water Tiger [ja]	40 Water Rabbit [ja]	41 Wood Dragon [ja]	42 Wood Snake [ja]
43 Fire Horse	44 Fire Goat [ja]	45 Earth Monkey [ja]	46 Earth Rooster [ja]	47 Metal Dog [ja]	48 Metal Pig [ja]
49 Water Rat [ja]	50 Water Ox [ja]	51 Wood Tiger [ja]	52 Wood Rabbit [ja]	53 Fire Dragon [ja]	54 Fire Snake [ja]
55 Earth Horse [ja]	56 Earth Goat [ja]	57 Metal Monkey	58 Metal Rooster	59 Water Dog [ja]	60 Water Pig [ja]
Heavenly Stems · Earthly Branches					

The Vietnamese article [Can Chi – Wikipedia tiếng Việt](#) contains this table below, in which the years progress diagonally, but the explanation of the 60-year cycle is not explicit (not clear) for non-mathematical readers.

	Tý (+)	Sửu (-)	Dần (+)	Mão (-)	Thìn (+)	Tỵ (-)	Ngọ (+)	Mùi (-)	Thân (+)	Dậu (-)	Tuất (+)	Hợi (-)
Giáp (+)	(01) Giáp Tý		(51) Giáp Dần		(41) Giáp Thìn		(31) Giáp Ngo		(21) Giáp Thân		(11) Giáp Tuất	
Ất (-)		(02) Ất Sửu		(52) Ất Mão		(42) Ất Tỵ		(32) Ất Mùi		(22) Ất Dậu		(12) Ất Hợi
Bính (+)	(13) Bính Tý		(03) Bính Dần		(53) Bính Thìn		(43) Bính Ngo		(33) Bính Thân		(23) Bính Tuất	
Đinh (-)		(14) Đinh Sửu		(04) Đinh Mão		(54) Đinh Tỵ		(44) Đinh Mùi		(34) Đinh Dậu		(24) Đinh Hợi
Mậu (+)	(25) Mậu Tý		(15) Mậu Dần		(05) Mậu Thìn		(55) Mậu Ngo		(45) Mậu Thân		(35) Mậu Tuất	
Kỷ (-)		(26) Kỷ Sửu		(16) Kỷ Mão		(06) Kỷ Tỵ		(56) Kỷ Mùi		(46) Kỷ Dậu		(36) Kỷ Hợi
Canh (+)	(37) Canh Tý		(27) Canh Dần		(17) Canh Thìn		(07) Canh Ngo		(57) Canh Thân		(47) Canh Tuất	
Tân (-)		(38) Tân Sửu		(28) Tân Mão		(18) Tân Tỵ		(08) Tân Mùi		(58) Tân Dậu		(48) Tân Hợi
Nhâm (+)	(49) Nhâm Tý		(39) Nhâm Dần		(29) Nhâm Thìn		(19) Nhâm Ngo		(09) Nhâm Thân		(59) Nhâm Tuất	
Quý (-)		(50) Quý Sửu		(40) Quý Mão		(30) Quý Tỵ		(20) Quý Mùi		(10) Quý Dậu		(60) Quý Hợi

[NOTE: For readers who are familiar with “matrices,” the above matrix can be read as follows: To form the name of a Lunar year, pair each row, representing one of the 10 Celestial stems, to each column, representing one of the 12 Terrestrial branches. At the end of Row 10, **Quý** (the 10th Celestial stem), go back up to Row 1, **Giáp** (the 1st Celestial stem). Similarly, at the end of Column 12, **Hợi** (the 12th Terrestrial branch), go back to Col 1, **Tý** (the 1st Terrestrial branch). Thus the Lunar years go down along the diagonals. ENDNOTE]

Life expectancy, why choosing 60-year cycle

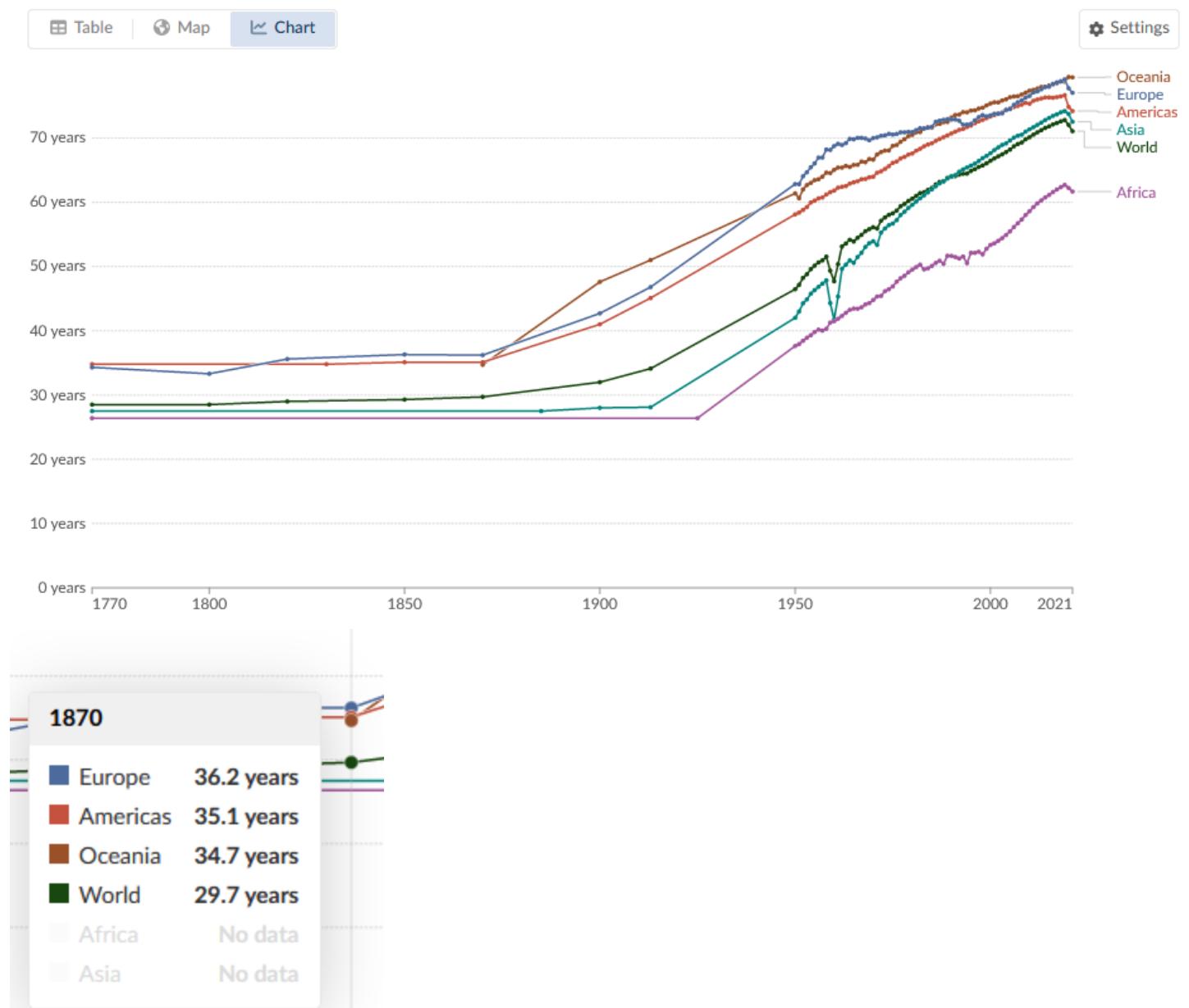
<https://ourworldindata.org/life-expectancy>

<https://ourworldindata.org/grapher/life-expectancy>

Life expectancy

The period life expectancy at birth, in a given year.

Our World
in Data



The ancients chose Method 2 with a 60-year cycle, instead of Method 1 with a 120-year cycle, because human life expectancy was well below 60 years, as shown in the above chart. Back in the 19th century (1870), human life expectancy was actually below 40 years. The average life expectancy for the whole world (except Africa and Asia) in 1870 was only 30 years.

[Life expectancy - Wikipedia](#)

Era	Life expectancy at birth in years	Notes

18th-century Prussia ^[40]	24.7	For males. ^[40]
18th-century France ^[40]	27.5–30	For males: ^[40] 24.8 years in 1740–1749, 27.9 years in 1750–1759, 33.9 years in 1800–1809. ^[33]
18th-century American colonies ^[17]	28	Massachusetts colonists who reached the age of 50 could expect to live until 71, and those who were still alive at 60 could expect to reach 75.
Beginning of the 19th century ^[42]	~29	At the beginning of the 19th century, no country in the world had a life expectancy at birth longer than 40 years, England, Belgium and the Netherlands came closest, each reaching 40 years by the 1840s (by which time they had been surpassed by Norway, Sweden and Denmark). India's life expectancy is estimated at ~25 years, ^[42] while Europe averaged ~33 years. ^[43]

Sixtieth birthday celebration

Living to 60 years old was a big achievement: [Sixtieth birthday in the Sinosphere - Wikipedia](#)

Various East Asian cultures have traditionally celebrated the 60th birthday. In Korean it is known as the **Hwangap** ([Korean](#): 환갑; [Hanja](#): 還甲) It is also celebrated in Japan, where it is known as **Kanreki** (還暦) in [Japanese](#) and in China as **Jiazi** (甲子) in [Chinese](#).

In the past, a person's [life expectancy](#) was much lower than today, so *hwangap* also meant a celebration of longevity.^[1] The celebration party is also a wish for an even longer and more prosperous life.

Ancient mathematicians

The above 60-year cycle issue was very easy for ancient mathematicians, who could compute the number “pi” to a high degree of accuracy.

[Pi - Wikipedia](#)

For thousands of years, mathematicians have attempted to extend their understanding of π , sometimes by computing its value to a high degree of accuracy. Ancient civilizations, including the [Egyptians](#) and [Babylonians](#), required fairly accurate approximations of π for practical computations. Around 250 BC, the [Greek mathematician Archimedes](#) created an algorithm to approximate π with arbitrary accuracy. In the 5th century AD, [Chinese mathematicians](#) approximated π to seven digits, while [Indian mathematicians](#) made a five-digit approximation, both using geometrical techniques.

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BOTTOM

Symbols



★ Image 1.1:

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